



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)



REPORT OF THE FOURTH MEETING
OF THE
WATER TREATMENT COMMITTEE
(With Railway Board's Orders)

April 1959

For official use only

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OF THE
WATER TREATMENT COMMITTEE
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II—Agenda for the Fourth Meeting of the Water Treatment Committee of the Indian Railways

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INTRODUCTION

The Water Treatment Committee of the Indian Railways held its fourth meeting on the 9th and 10th September, 1957, at Bombay and herewith submits its minutes.

The Committee consisted of the following :

- | | |
|--|----------------------------|
| (1) Shri R. G. Bhatawadekar,
Jt. Director, Research (M & C),
Railway Testing & Research Sub-Centre,
Chittaranjan. | <i>Chairman</i> |
| (2) Shri J. N. Gupta,
Dy. Chief Mechanical Engineer (L),
Northern Railway,
New Delhi. | <i>Co-opted
Member</i> |
| (3) Shri K. P. S. Nair,
Chemist & Metallurgist,
Central Railway,
Parel. | <i>Member</i> |
| (4) Shri N. V. Pandit,
Chemist & Metallurgist,
South-Eastern Railway,
Khargpur. | <i>Member</i> |
| (5) Shri G. R. Iyengar,
Chemist & Metallurgist,
Southern Railway,
Perambur. | <i>Member</i> |
| (6) Shri S. Ramanujam,
Dy. Director, Research (M & C),
Railway Testing & Research Sub-Centre,
Chittaranjan. | <i>Secretary</i> |

Shri L. R. Fialho, Assistant Chemist & Metallurgist (WS), Western Railway, Bombay, attended the meeting.

The Committee inspected engines fitted with automatic dosing gears at Parel shed of the Western Railway.

(Sd.) R. G. Bhatawadekar
Chairman

(Sd.) J. N. Gupta
Co-opted Member

(Sd.) G. R. Iyengar
Member

(Sd.) K. P. S. Nair
Member

(Sd.) N. V. Pandit
Member

(Sd.) S. Ramanujam
(Secretary)

Bombay,
September 10, 1957.

MINUTES OF THE FOURTH MEETING OF THE WATER TREATMENT COMMITTEE OF THE INDIAN RAILWAYS

(September 1957)

ITEM I: UP TO DATE POSITION OF LOCOMOTIVES UNDER TREATMENT

AGENDA: To review the up to date position of the number of locomotives receiving treatment.

NOTES BY THE SECRETARY

The up to date position of the number of locomotives receiving treatment is as follows :

<i>Railway</i>	<i>Division/District</i>	<i>Section/Shed</i>	<i>No. of engines</i>		
Central	Sholapur	Dhond-Manmad	28		
		Dhond-Baramati	2		
		Kurduwadi-Miraj-Latur	19		
	Jhansi	Jhansi-Kanpur	}	52	
		Jhansi-Manikpur			
		Gwalior-Sheopur Kalan			
		Gwalior-Shivpuri			
		Gwalior-Bhind			
	Nagpur	Wardha-Balharshah	19		
				144	
Eastern	Sealdah	Beliaghata	}	135	
		Narkeldanga			
		Chitpur			68
		Naihati			45
	Howrah	Bamangachi	64		
			312		
Northern	Jodhpur	Jodhpur-Pokaran	3		
		Samdari-Raniwara	3		
	Moradabad	Lhaksar-Dehra Dun	4		
			10		
South-Eastern	Adra	Bhojudih colliery area	12		
	Khargpur	Khargpur	21		
		Santragachi	31		
			64		
Southern	Madura	All sections	164		
	Hubli	Gadag-Sholapur	39		
	Bangalore	Bangalore-Bangarapet	8		
	Mysore	Chikjajur-Chitaldroog	3		
			214		
Western	Ajmer	Gandhidham	3		
	Baroda	Nadiad	10		
		Dabhoi	42		
		Halol	4		
		Godhra	27		
		Anklesvar	5		
	Bhavnagar	Jetalsar	43		
		Junagadh	28		
	Rajkot	Hapa	56		
		Wankaner	49		
		Morvi	4		
		Surendranagar	41		
		Mehsana	40		
		Sabarmati	60		
				412	
Grand Total :			1,156		

Railway	Division/District	Section/Shed	No. of engines	
Central	Sholapur	Dhond-Manmad	28	
		Dhond-Baramati	3	
		Kurduwadi-Miraj-Latur	19	
	Jhansi	Poona-Raichur	51	
		Jhansi-Kanpur	}	54
		Jhansi-Manikpur		
		Gwalior-Sheopur Kalan	}	27
		Gwalior-Shivpuri		
		Gwalior-Bhind		
	Nagpur	Wardha-Balharshah	33	
			215	
Eastern	Sealdah	Beliaghata	}	135
		Narkeldanga		
		Chitpur		68
	Howrah	Naihati		45
		Bamangachi		64
			312	
South-Eastern	Adra Khargpur	Bhojudih colliery area	12	64
		Khargpur	21	
		Santragachi	31	
Southern	Madura	All sections	164	214
	Hubli	Gadag-Sholapur	39	
	Bangalore	Bangalore-Bangarapet	8	
	Mysore	Chikjajur-Chitaldroog	3	
Western	Ajmer	Abu Road	70	476
	Baroda	Gandhidham	5	
		Nadiad	10	
		Dabhoi	42	
	Bhavnagar	Halol	4	
		Anklesvar	5	
		Godhra	29	
		Jetalsar	43	
	Rajkot	Junagadh	25	
		Hapa	51	
		Wankaner	48	
		Morvi	5	
		Surendranagar	41	
		Mehsana	38	
		Sabarmati	60	
			476	
			Grand Total :	1,281
Northern	Moradabad	Lhaksar-Dehra Dun	4	30
	Jodhpur	Jodhpur-Fokaran	3	
		Samdari-Raniwara	3	
	Bikaner	Churu-Rewari	3	
		Churu-Sadulpur	2	
		Churu-Sardarshahr	2	
		Sadulpur-Hissar	2	
		Hanumangar-Sadulpur	11	
			30	

Number of locomotives receiving treatment by means of automatic dosers

South-Eastern Railway	...	2 (trials)
Southern Railway	...	4 (trials)
Western Railway	...	90

RAILWAY BOARD'S ORDERS

Noted. Northern Railway should recommence treatment early by using recommended alternative tannin materials.

ITEM II : PROGRESS OF WATER-TREATMENT

AGENDA : To review the progress of water-treatment on the different railways and to make recommendations.

NOTES BY THE SECRETARY

The main observations from the reports collected from the various railways are given in Appendix A.

It may be seen that, while, in general, the treatment has resulted in the satisfactory condition of the fire box region of boilers, accumulation of scale at the smoke box end still persists, though at a slower rate than before the treatment.

In a number of sections the full quota of staff required for the treatment has not been appointed. With the personal element involved in the system of manual dosing and the uncertainties associated with it, unsatisfactory results have been reported which may be attributed to irregular treatment on line in the absence of effective supervision.

The importance of control of treatment cannot be over-emphasised. As a result of experience on the French Railways, it has been stated that 75% of the benefits derived from this system of water-treatment is due to proper mechanical control and supervision while only 25% accrues from the chemical aspects of treatment. In other countries, elaborate machinery for the control of water-treatment including blowdowns exists. On the French National Railways, it is understood that there is a chief chemical engineer at the top of the organisation dealing with water-treatment. There are 3 mechanical engineers under him, 3 inspectors and 3 hands for every 100 locos. As a result of substantial cut in boiler repairs, staff retrenched from repair sections have been diverted to control of water-treatment.

Staff for the control of treatment on the Indian Railways was recommended as far back as in November, 1952, in the 2nd meeting of the Water Treatment Sub-committee, but this has remained largely unimplemented. In sections where manual dosing is in progress, staff for supervising addition of compound on line and to control treatment in a general way should be provided on a priority basis. When automatic dosing gears are fitted to engines, it will still be necessary to have some staff to exercise control of a more technical nature. The expenditure incurred on the treatment control staff will be more than compensated by savings resulting from substantial reduction in boiler repair costs, increased engine availability and less fuel consumption.

An answer to the prevailing difficulty of scaling in the boiler barrel is an increased dosage of boiler compound to engines. But with all the limitations involved in the system of manual dosing, it has not been possible to ascertain how far this is essential, consistent with economy. It appears therefore necessary to take immediate action on the following lines :

- (1) In each section under treatment, a start should be made to provide staff for control of treatment.
- (2) Automatic dosing gears should also be introduced. A beginning can be made by fitting not less than 2 engines in each of the sheds under treatment well before the commencement of summer. The dosage at present used in the sections should continue to be introduced automatically.
- (3) The results thus obtained should be communicated every month to the Railway Testing and Research Sub-centre, Chittaranjan, for necessary action.

RECOMMENDATIONS BY THE COMMITTEE

It is noted that, while, in general, the result of the treatment has been satisfactory in a number of engines, scaling in boilers is noticed as for instance in the Dhond and Madura sheds. This is attributed to non-implementation of the recommendations made by the Committee, from time to time. To achieve the maximum benefits from the treatment, it is essential that particular attention be paid to the following :—

- (a) Control of treatment by appointment of supervisory staff in each treatment shed on the lines of the recommendations made under items 5 & 6 of the minutes of the 2nd meeting of the Water Treatment Sub-committee held in November 1952.
- (b) Fitting of deflectors under the clack box of boilers as recommended under item 5 of the minutes of the 7th meeting of the Water Treatment Sub-committee. The Research Design & Standardization Organisation (Designs) should be requested to prepare and issue part drawings of deflectors for standard I. R. S. engines.

- (c) Introduction of the chemical solution by means of a hydrostatic dosing gear designed by the R. D. S. O. (Designs) and modified by the Western Railway in the light of the results of practical trials.
- (d) Enforcement of periodical and timely blowdowns to engines.

RAILWAY BOARD'S ORDERS

Noted. Railways should take early action in accordance with the Committee's recommendations (a), (b), (c) & (d).

R. D. S. O. (Loco. Designs) to take action in respect of recommendation (b).

ITEM III : TRIALS WITH INDIGENOUS TANNINS

AGENDA : To consider the results of trials with indigenous tannins.

NOTES BY THE SECRETARY

The trials with copper vat cutch tannin which were started on engines Nos. 275 (copper fire box) and 1449 (steel fire box) in the Narkeldanga shed on 5-1-57 and 6-4-57 respectively, continued till the end of July, covering the entire summer period.

Except for scaling on tubes under the top feed inlet to a thickness of 1/8 in. and over, the general condition of boilers of both the engines has been observed to be satisfactory. In engine No. 275, scaling was noticed on the right side of the boiler near the smoke box end. This may be attributed to the deflector tube pointing to the right side of the boiler. The condition of tubes, on engine No. 1449 is clean. In both the engines, the fire box portion continued to be clean throughout the period of trials.

Trials with this indigenous tannin were also carried out on 2 engines of Wankaner and Surendranagar sheds on the Western Railway. The results are understood to be satisfactory although no details regarding the trials on these engines are available. The Assistant Chemist & Metallurgist, Western Railway, may please give details regarding these trials.

Similar trials were also recommended on 2 engines of Dhond-Manmad section on the Central Railway in the 2nd meeting of the Water Treatment Committee in August 1956. These have, however, not been carried out.

In September last year, a cut of 25% in the imports of chestnut tannin was imposed by the Govt. of India. It is possible that its import may be stopped completely in the near future. As a result of short-supply of chestnut tannin for water-treatment, difficulties have been experienced by a few railways in carrying out the treatment on sections where internal treatment is already well set. Since satisfactory results have been obtained in the trials with copper vat cutch tannin, it is suggested that this tannin be recommended for general internal treatment on railways. In fact, in June last, on a reference from the Western Railway (see Appendices B, C&D) use of copper vat cutch tannin was recommended in place of chestnut tannin as and when necessary. Similar advice was given to the Northern Railway. On the Southern Railway, it is understood that wattle extract has been used on the Madura division.

Reference to the literature reveals that favourable results have been obtained with the use of wattle extract for internal treatment. It is gathered that this material is still in the O. G. L. list of the Government and therefore may be expected to be freely available in the market. Since only a part of the total tannin requirements of the railways is, at present, available from the Indian Wood Products Co. Ltd., it appears that wattle extract may advantageously be used for water-treatment, till such time as the railways' demand for tannin for internal treatment is fully met from indigenous sources. In view of the above, the Chemist & Metallurgist, Southern Railway, may please give the experience of that railway with regard to the use of wattle bark tannin.

The Indian Wood Products Co. Ltd. (Managing Agents : M/s. Gillanders Arbuthnot & Co., 174, Clive Buildings, Calcutta-1) were contacted by the Railway Testing & Research Sub-centre, Chittaranjan, to find out if they were in a position to meet the entire tannin requirements of the Indian Railways amounting to about 500 tons per annum at the moment. The above firm is at present in a position to supply only 100 tons of the copper vat cutch tannin per annum. It can, however, meet the entire demand of the railways provided more Khair trees and the necessary machinery are made available to the firm. This is being examined. A few tannin manufacturers in the country were also approached with a view to finding if supplies similar to copper vat cutch tannin could be obtained at competitive prices. So far only one firm has sent a sample which is, however, more expensive. Data on its tannin content could not also be supplied by the firm due to want of analytical facilities.

Meanwhile, preliminary laboratory experiments have suggested the possibility of using mangrove (goran) tannin for internal treatment. Mangrove extract is not at present

manufactured in the country. Arrangements are, therefore, being made to get the extract prepared for preliminary experiments in a stationary boiler before practical trials on locomotives can be undertaken.

RECOMMENDATIONS BY THE COMMITTEE

It is recommended that indigenous copper vat cutch tannin be also used for internal treatment on railways in place of chestnut tannin.

Where available, wattle bark extract (tannin) can also be used.

The Research Design & Standardization Organisation (Research) should explore possibilities of increasing the production capacity of copper vat cutch tannin and also other suitable varieties of indigenous tannins for water-treatment.

RAILWAY BOARD'S ORDERS

Noted. Approved

ITEM IV : AUTOMATIC DOSING GEARS

AGENDA : To review the progress made in the installation of automatic dosing gears.

NOTES BY THE SECRETARY

The Western Railway has recorded substantial progress in respect of installation of automatic dosing gears on engines under treatment. It is reported that 200 sets of dosing gears to the design devised by the Western Railway have been procured from the Trade and these are being fitted to engines receiving treatment. The exact number of engines thus fitted with dosing gears may please be made available to the Committee by the Assistant Chemist & Metallurgist, Western Railway.

Some difficulty was experienced in filling the solution tank of the dosing gear (to the revised design of the Western Railway). It was necessary to empty the tender every time the solution tank was to be filled with the boiler compound solution. To overcome this difficulty the length of the air pipe extending into the tender was adjusted depending on the lowest water level in the tender during run of engines on line. As a result of this, it is now no longer necessary to empty the tender completely before charging the solution tank. At the same time, the functioning of the dosing gear is not affected as the length of the air pipe is sufficient to keep its bottom (open) end under water at all times during the run of engines on line. (See Appendix E.)

The Central Railway sent their representative to the Western Railway to study the automatic dosing gears on that railway in action, with a view to adopting these gears on the Central Railway. The representative has reported that the dosing arrangements are functioning satisfactorily. It is expected that early action will be taken by the Central Railway in regard to fitting engines receiving treatment with automatic dosing arrangements.

On the Southern Railway it is noticed that dosing gears are not being operated though these have been fitted to four GS class engines of Gadag shed, between December '56 and April '57.

On the South-Eastern Railway, trials were conducted on WG locomotives fitted with hydrostatic dosing gears to the Central Standards Office design, but these were not successful as the clack valve had a tendency to get choked frequently. Fresh trials are under way with a dosing arrangement in which the clack valve has been eliminated.

No information is available as regards action taken by other railways where treatment is in progress.

RECOMMENDATIONS BY THE COMMITTEE

It is noted that the Western Railway has made arrangements to procure from the Trade 300 automatic dosing gears according to the modified design. Out of these, 90 have so far been received and fitted on engines. The Research Design & Standardization Organisation (Designs) should be requested to standardise the design used on the Western Railway and issue it to all other railways to enable them to expedite fitting locomotives with the automatic dosing gears.

2. If necessary, the railways should obtain from Trade standardised automatic dosing gears.

RAILWAY BOARD'S ORDERS

Para 1—R. D. S. O. (Loco. Designs) to take early action.

Para 2—Approved.

ITEM V : TRIALS WITH CARBION BASE- EXCHANGE MATERIAL

AGENDA : To consider the results of trials with Carbion base-exchange material.

NOTES BY THE SECRETARY

Trials with Carbion base-exchange material developed by the Fuel Research Institute, Jealgora, were recommended, vide item III of the 6th meeting of the Water Treatment Sub-Committee in August 1954. These were started at Bhalavni (Central Railway) on 1-6-57. By prior arrangement the representative from the Fuel Research Institute was also present during the trials. During the 2nd run of the plant, after regeneration, the softening capacity suddenly fell to 11,000 gallons as against 36,000 gallons softened in the first run. The difficulty was diagnosed to be due to channel formation either during brine injection or during water softening. (See report of the Fuel Research Institute at Appendix F.) This was suitably rectified in the subsequent runs. The plant softened on an average 26,000 gallons of raw water per cycle lasting for approximately 6 hours.

The specific gravity of salt solution used at Bhalavni for regeneration of the base-exchange material was 1.2. According to a letter from the Assistant Director, Fuel Research Institute (see Appendix G) the total volume of brine solution used is important from the point of view of operative capacity. He has therefore recommended a specific gravity of 1.07. In this connection, the Chemist & Metallurgist, Central Railway, has pointed out (see Appendix H) that the saturated brine solution automatically gets diluted to about 10% concentration (specific gravity 1.07) when it is drawn into the softener barrel. The quantity of common salt required for removing 1,000 grains of hardness works out to 0.52 lb for Carbion, as against 0.50 lb. for Zeo-karb originally used in Bhalavni plant. Further, when the Zeo-karb was fresh, the figure was only 0.35 lb per 1,000 grains with single regeneration.

The trials are being continued. Further observations are necessary before a decision can be taken in regard to the use of the material on the railways.

RECOMMENDATIONS BY THE COMMITTEE

The Central Railway and the Research Design & Standardization Organisation (Research) should follow the progress of the Carbion trials and submit a report in due course to the Committee.

RAILWAY BOARD'S ORDERS

Central Railway and R. D. S. O. (Research) to pursue.

ITEM VI : AUTOMATIC DESLUDGING DEVICES

AGENDA : To review progress of trials with "Gestra" and "Dewrance" automatic desludging devices

NOTES BY THE SECRETARY

Arrangements have been made by the Central Standards Office, Chittaranjan, to obtain from M/s. Dodsai, Private, Ltd., Bombay, 2 numbers of "Gestra" device type ALN for practical trials on locomotives. The trials will be started when these gadgets are received.

Similarly, M/s. Kilburn & Co. Ltd. (4, Fairlie Place, Calcutta) have been approached by the Central Standards Office, Chittaranjan, in connection with the supply of 2 units for trials on locomotives and a reply is awaited from the firm.

RECOMMENDATIONS BY THE COMMITTEE

The Research Design & Standardization Organisation should conduct trials and submit a report on the efficiency of the Gestra & Dewrance desludging devices as regards water-treatment.

RAILWAY BOARD'S ORDERS

R. D. S. O. (Research) to follow.

ITEM VII : WASHOUT PROCEDURE

AGENDA : To review the progress of trials with the washout procedure of locomotives suggested by the American Boiler Makers' Association

NOTES BY THE SECRETARY

Action has been taken by the South-Eastern Railway to commence trials with the procedure for washout of locomotives suggested by the American Boiler Makers' Association. A letter received from the Chief Mechanical Engineer, South-Eastern Railway, in this connection is in Appendix I. The results of the trials are awaited. The Chemist & Metallurgist, South-Eastern Railway, may please give the latest position.

RECOMMENDATIONS BY THE COMMITTEE

The action taken by the South-Eastern Railway is noted. A report should be submitted by the railway to the Research Design & Standardization Organisation (Research) in due course.

RAILWAY BOARD'S ORDERS

Noted.

ITEM VIII : BLOWDOWN COUNTERS

AGENDA : To consider progress in respect of blowdown counters

NOTES BY THE SECRETARY

A note from the R. D. S. O. with regard to the above is enclosed in Appendix J. It will be seen from this that further trials have to be conducted with modified designs before a decision can be taken in regard to its general use on locomotives.

RECOMMENDATIONS BY THE COMMITTEE

It is noted that trials with blowdown counters are being pursued by the Research Design & Standardization Organisation. A report on the trials should be submitted in due course for the information of the Committee.

RAILWAY BOARD'S ORDERS

R. D. S. O. (Research) to take necessary action early.

ITEM IX : PROGRESS REPORTS

AGENDA : To consider half-yearly progress reports from railways

NOTES BY THE SECRETARY

The half-yearly progress reports received from the Chief Mechanical Engineers, South-Eastern Railway and Western Railway are in Appendices K and L.

Other reports, if received in time, will be tabled at the meeting for perusal by the members.

RECOMMENDATIONS BY THE COMMITTEE

The half-yearly progress reports received from the Chief Mechanical Engineers, South-Eastern and Western Railways were considered. It is noted that the progress in these railways has been satisfactory. Other railways should also submit their reports in time so as to have an overall appreciation of the progress of treatment.

RAILWAY BOARD'S ORDERS

Noted. Central, Eastern, Southern and Northern Railways should submit the reports regularly to the Committee

**ITEM X : REVIEW OF ACTION ARISING OUT OF THE
MINUTES OF THE LAST MEETING**

AGENDA : To review action arising out of the minutes of the last meeting

NOTES BY THE SECRETARY

Progress of treatment on railways (Item II)

Central Railway

Kurduwadi-Miraj-Latur :—It is noticed that all engines have not yet been brought under tannin treatment. There are still 6 engines which are receiving treatment with Alfloc. It is stated that investigation has to be carried out before the recommendation may be implemented. It may be stated that 'Alfloc' is a proprietary article and the Water Treatment Committee is not in favour of such materials. The Chemist & Metallurgist, Central Railway, may please give his comments.

Wardha-Balharshah :—The Chemist & Metallurgist, Central Rly., may please state whether all the engines on this section have been brought under treatment. If not, the number of engines receiving treatment may be given.

Balharshah-Kazipet :—Orders have been issued by the Chief Mechanical Engineer, Central Rly., to the division concerned for commencing treatment on this section. The present position may please be indicated by the Chemist & Metallurgist, Central Railway.

Progress regarding extension of washout mileages (Item V)

According to information available in this office, there has been no change in the washout mileage figures from those reported at the time of the last meeting.

Extension of internal treatment (Item IX)

(i) *Ledo-Tinsukhia-Dibrugarh :*

According to a letter received from the North-Eastern Rly. appreciable improvement has not been noticed on the condition of boiler with respect to scaling and pitting, despite addition of recommended dosages for the past 4 months. The trial is, however, continuing and observations are now being made on locomotives which have recently come from P.O.H. It is noticed that no monthly reports were forwarded to this office on the boiler condition of engines on which treatment was carried out. To enable the Sub-centre to suggest suitable remedial measures, details have therefore been called for from the North-Eastern Railway.

(ii) Analytical data on feed waters on the Secunderabad division have been forwarded by the Chemist & Metallurgist, Central Railway. However, information on the lines of the questionnaire issued by the Railway Testing and Research Sub-centre, Chittaranjan, on 'bad' water sections has been called for. On receipt of this, necessary recommendation will be made.

RECOMMENDATIONS BY THE COMMITTEE

(i) *Kurduwadi-Miraj-Latur section :*

The Chemist & Metallurgist, Central Railway, stated that the present chemical complex has shown no improvement over the proprietary material 'Alfloc'. It is, therefore, recommended that this section be brought under the overall supervision of the Research Design & Standardization Organisation (Research) who will work in collaboration with the staff to be provided by the Central Railway.

(ii) *Balharshah-Kazipet :*

It is noted that the treatment has not yet commenced on this Section.

RAILWAY BOARD'S ORDERS

(i) *Approved.*

(ii) *Central Railway should commence treatment early.*

ITEM XI : MISCELLANEOUS SUBJECTS

AGENDA : To consider any other subject.

RECOMMENDATIONS BY THE COMMITTEE

*Extension of treatment :—*It is recommended that internal treatment be extended to the Vizagapatam Port area of South-Eastern Railway.

RAILWAY BOARD'S ORDERS

Approved.

APPENDIX A

Observations on water-treatment in progress on the railways

1. Central Railway

Dhond-Manmad & Dhond-Baramati :—Scaling on tubes and fire box plates continues to be reported in engines receiving internal treatment. The thickness of scale in the fire box region is, however, less than $1/8''$. Even water ways and injectors are reported to get scaled though only slightly. It has been necessary to remove a large number of tubes and flues during M. O. H. of engines in order to remove the loose scale congesting the boiler barrel. Corrosion and priming have, however, been effectively eliminated.

During the period between January and June, three engine failures due to leaky tubes have been reported. The washout mileage has also been reduced to 912 for all engines as against 1296 & 876 miles previously in force for goods and passenger engines, respectively. It is noted that no automatic dosing arrangements have yet been fitted to any of the engines of the Dhond shed. Treatment is carried out only manually. It is understood that this manual addition has not been carried out regularly on line. It is, therefore, possible that bad results are due to irregular dosing.

In order to overcome objections from drivers to dosing of engines on line, water bags were supplied to the engine crew, so as to provide drinking water facilities. From reports, it appears that this has not improved the situation.

Poona-Raichur section :—51 engines are under tannin treatment from 15-2-1957 and the results are satisfactory.

Kurduwadi-Miraj-Latur :—Four more engines have been brought under internal treatment since the last meeting of the Committee. The total number of engines receiving treatment at present is 19. During the last meeting it was recommended that all engines be brought under tannin treatment. This has not been implemented.

It is found necessary to remove a number of tubes periodically to dislodge scale accumulating in the boiler barrel. The fire box plates of engines are, however, reported to be nearly clean.

Gwalior shed :—Gwalior-Shivpuri section continues to be under treatment with 60:40 tannin-soda ash complex while only tannin is used for treatment in the Gwalior-Bhind and Gwalior-Sheopur Kalan sections.

Accumulation of loose scale has been reported in the boiler barrel resulting in periodical descaling.

Satisfactory results have been reported from other sections under treatment.

2. Eastern Railway

Howrah Loco shed :—Except in the case of 4 engines, which are receiving treatment with a dosage of $1/2$ lb. of the boiler complex as a trial measure, treatment continues in the case of other engines with $1/4$ lb. dosage. For descaling, a few tubes had to be removed to facilitate dislodgment of the scale from the boiler barrel. Polyamide is being used successfully to arrest priming experienced in the summer period.

Narkeldanga and Beliaghata sheds :—Scaling is observed on tubes to a thickness less than $1/8''$ at the smoke box end of boilers. In the case of Beliaghata shed engines, the accumulation of scale is found to be rapid, necessitating periodical detubing to descale the boiler. Otherwise, the treatment has given satisfactory results. Polyamide is being used to arrest priming in engines of these sheds.

Satisfactory results have been reported from the rest of the sections under treatment. Successful use of polyamide was made to overcome priming troubles in Chitpur shed.

3. Northern Railway

Jodhpur division :—Treatment commenced on all the 3 engines of Jodhpur-Pokaran section and all the 4 engines on Samdari-Raniwara section with effect from 1-2-57. The results so far are noted to be satisfactory.

No information is available about the commencement of treatment in the Jodhpur-Kuchaman Road and Degana-Ratangarh sections recommended in the first meeting of the Water Treatment Committee.

Moradabad division :—Treatment commenced on 4 engines out of a total of 11 in the Lhaksar-Delhra Dun section. The results of treatment are being watched.

Bikaner division :—A number of sections on the Bikaner division were recommended for treatment during the 1st meeting of the Water Treatment Committee in March 1956. At the time of the last meeting, it was stated that 16 engines of Churu shed on this division were receiving treatment. It is now gathered that no internal treatment is in progress in any of the sections on this division.

4. South-Eastern Railway

Bhojudih colliery area :—Only 12 engines are receiving internal treatment at the moment. Arrangements have, however, been completed to commence treatment on the remaining engines also from next month.

Santragachi :—All engines other than WM class locomotives continue to receive internal treatment. The 4 WM class engines 9025, 9002, 9003 & 9024 are still under observation. The last one is given no treatment while the remaining are given a dosage of 1 lb of tannin-soda ash complex for 1000 gallons. Internal treatment for WM class engines has been kept in abeyance, pending final decision on the measures to be adopted for arresting tube leakages experienced during the initial stages.

Khargpur shed :—Satisfactory progress is reported from this shed.

5. Southern Railway

Madura shed :—Scaling is reported in a number of engines both on the tubes and fire box plates. It may be noted that in March 1956, when members of the Water Treatment Committee visited this shed, the

engines were observed to be in a very satisfactory condition. Addition of boiler compound to engines is carried out manually on line. It is gathered that this manual dosing has not been carried out regularly on all watering columns, as recommended by the Committee. The bad results are therefore attributable to the irregularity of dosing on line.

Corrosion and priming have, however, been effectively combated. There has been no change in the washout mileage figures for engines.

Gadag-Sholapur section :—Congestion of boiler barrel with loose scale has been reported, though the rate of accumulation of scale is much slower than before treatment. Periodical removal of tubes and flues has been necessary to clear the accumulated scale in the boiler barrel.

Nine instances of engine failure on boiler account have been reported between the period January and June. Recently in June, the washout mileage for all engines has been reduced to 400 against the previous figure of 800.

Madras-Waltair section :—It is gathered that instructions have been issued by the Chemist & Metallurgist, Southern Railway, on 30-1-57 for commencing treatment. The Chemist & Metallurgist, Southern Railway, may please state if the treatment has since been started. The progress of treatment is satisfactory in all other sections on this Railway.

6. Western Railway :

Sabarmati shed :—Satisfactory progress of treatment has been reported from this shed. Polyamide is being used successfully to arrest priming observed on engines working more than 600 miles.

Mehsana shed :—Reports continue to be received that scaling takes place in tube areas within a period of 6 to 8 months after descaling. Priming is also experienced and polyamide is used successfully to overcome this trouble. Two engine failures on account of leaky tubes have been reported in the month of July.

Surendranagar shed :—Overheating has been reported in the case of engines of this shed.

In general, it may be stated that, while the progress of treatment has been satisfactory in a majority of engines, scaling to a thickness of more than 1/8" has been reported on some engines of Surendranagar, Wankaner, Jetalsar and Jamnagar sheds.

APPENDIX B

Copy of D. O. letter No. M. 54/4/14/4 dated 14th August, 1957, from Shri L. R. Fialho, Assistant Chemist and Metallurgist (WS), Western Railway, Churchgate, Bombay, to Shri R. G. Bhatawadekar, Joint Director, Research, Railway Testing and Research Centre, Chittaranjan.

Sub :—Supply of tannin

You are aware that there are nearly 500 locomotives under tannin treatment on this Railway and as a result the procurement of adequate and regular supplies of foreign tannin is continually presenting a problem.

2. The fact that to-day this foreign tannin is linked with the tight exchange position has made matters worse, as for every order placed on the firm we have to obtain the Board's approval that foreign exchange to the value of the consignment is available. I attach herewith a letter from the Board from which it is evident that no further orders can be placed on the firm until October 1957. (See Appendix C.)

3. I, therefore, feel that the time has come when a decision to use indigenous copper vat tannin should be taken so that Railways could freely indent for the same without having to make a reference to you. From the trials conducted on two engines since May, 1957 on this Railway, there does not appear to be any reason why the indigenous tannin should not be recommended for use because it compares favourably with the foreign variety in its ability to keep the boiler clean.

4. You will recall that in June, 1957 when our supplies had run low, Shri Krishnaswamy our ex-Chief had trunk-called Shri Ramanujam in your absence and had obtained your concurrence to utilise copper vat tannin lying with the Central Railway, to tide over this lean period. Anticipating a recurrence of such a period, we had instituted inquiries with M/s. Arbuthnot & Co. in respect of the procurement of tannin and a copy of their reply is also attached. (See Appendix D.)

5. It will be seen, however, that the indigenous variety is priced at Rs. 85/- per cwt. which is approximately Rs. 24/- per cwt. more expensive than the foreign extract, but placed as we are with respect to the exchange position in the matter of currency, there appears to be no other alternative but to adopt the use of indigenous tannin.

6. Your concurrence, therefore, to indent for copper vat cutch tannin in place of the foreign Chestnut variety may kindly be communicated to this Railway as early as possible, so that procurement action may be initiated by Stores.

APPENDIX C

Copy of letter No. F (IX) 57/II/2/7 (1434) dated 25th July, 1957, from the Joint Director, Finance (Expenditure), Railway Board, New Delhi, to the General Manager (Stores), Western Railway, Bombay.

Sub :—Foreign exchange sanction for the procurement of 1,420 cwts. of Tannin.

Ref :—Your letter No. S. 434/28/14 (P4-57) dated 3-7-57 on the above noted subject.

In view of the tight foreign exchange position of the country the procurement of tannin may be postponed for 3 months. You may approach the Board for the necessary foreign exchange sanction in October 1957.

APPENDIX D

Copy of letter No. B/111/P/380 of 23rd July, 1957, from Indian Wood Products Co. Ltd., Gillanders Arbuthnot and Co. Ltd., Clive Buildings, Calcutta 1, to the Controller of Stores, Western Railway, General Office, Churchgate, Bombay.

Re : Supply of Pulverised C. V. Cutch.

We thank you for your letter No. S. 434/28/13 (P4-56A) dated 10-7-57 and are pleased to note that you are interested in the supply of 600 cwts. pulverised C. V. Cutch.

2. We are in a position to supply this in 6 months at the rate of 100 cwts. per month commencing from one month after receipt of your order. Our price will be Rs. 85/- per cwt. f. o. r. Izatnagar packed in special waterproof double paper bags in wooden cases, exclusive of any sales tax. In case you are able to arrange for the pulverisation yourselves we can offer the C. V. Cutch in block form at Rs. 80/- per cwt. f. o. r. Izatnagar.

3. We look forward to receiving your order at an early date.

APPENDIX E

Copy of letter No. M. 540/4/14 dated 13th August, 1957, from the Chief Mechanical Engineer, Western Railway, Churchgate, Bombay, to the General Manager (Mech.), Southern Railway Headquarters Office, Aynavaram P. O., Madras—23.

Sub :—Water-treatment on railways—Fitment of hydrostatic dosing gears.

Ref :—This office letter of even No. dated 21st December, 1956.

The hydrostatic dosing gears installed on this Railway were subjected to service trials and it was found that under certain combination of tank water level and dosing tank solution level, same difficulty was experienced in replenishing the complex in the dosing tank due to the presence of an air lock.

2. To obviate this difficulty it was found necessary to reduce the length of the air enclosing pipe shown in drawings sent with this office letter cited above by 1 ft 6 in. This reduction in the length of the pipe does not interfere with the treatment of the water, because very seldom, if at all, is water permitted to fall to 1½ ft. in the tender.

APPENDIX F

Extract from the report submitted by the representative of the Fuel Research Institute on trials with Carbion at Bhalavni.

The plant with previous Zeolite of about 50 cu. ft. capacity had never softened water below 2° p.p. 100,000 with the following average data during the year 1956:

Gallons of water softened	Hardness in p.p. 100,000
5,000	2
10,000	2.6
15,000	3.5
20,000	5.5
<i>Average data during 1955</i>	
10,000	1.7
15,000	5.0
20,000	7.0

(After charging the plant with Carbion) the plant was put to operation on the 1st of June by injecting about 200 lb of 10⁰/₀ common salt solution. There was no water meter and the total water pumped was calculated from the pressure gauge which has been calibrated by the filter-mechanic for this purpose. The rate of pumping varied from 4,500 gallons per hour to 5,000 gallons per hour.

The following is the data for the first run :

Gallons of water softened	Residual hardness p.p. 100,000 (Leakage)
9,000	0.4
20,000	0.3
29,000	0.3
33,500	0.5
35,750	1.0
36,750	1.2

In course of the second run the softening capacity suddenly dropped to about 11,000 gallons. Next three runs were tried with 210,220 and 250 lb of common salt (for regeneration) so as to find out the causes of its sudden fall to such a low softening capacity. None of these trials gave more than 11,000 gallons of softened water. All these trials were continued till 3rd June. The reason for this lowering in the softening capacity was

suspected to be due to channel formation during brine injection or during water softening. The plant was again opened on the 4th of June and the required brine solution was percolated manually with buckets of solution and the bed washed as usual. With this technique the plant softened 27,000 gallons of water with residual hardness of less than 1 p.p. 100,000. This proved that during brine injection (which was being done by vacuum suction) a channel was being formed and thereby major portion of Carbion escaped regeneration. After rectification the following were the results of the subsequent runs:

Regenerated with 145 lb. of NaCl

4-6-1957

I Run

Gallons of water softened

Residual hardness
p.p. 100,000

9,000	0.2
18,000	0.3
22,500	0.4
26,000	0.8
27,000	2.1

5-6-1957

II Run

Regenerated with 162 lb. NaCl

9,000	0.3
18,000	0.4
26,000	0.4
27,000	1.0

5-6-1957

III Run

Regenerated with 180 lb. NaCl

13,500	0.4
22,500	0.5
24,750	1.0
26,000	2.1

6-6-1957

IV Run

Regenerated with 147 lb. NaCl

18,000	0.5
22,000	0.6
24,625	0.9
26,000	1.6

6-6-1957

V Run

Regenerated with 200 lb NaCl

13,500	0.3
22,500	1.0
24,000	1.2

The above results show that the average softening capacity of the plant with Carbion is about 26,000 gallons per regeneration with less than 1 p.p. 100,000 residual hardness as against about 10,000 gallons (with hardness 2 p.p. 100,000) with Permutit Zcolite.

As soon as the residual hardness reaches 1.0 to 1.5 p.p. 100,000 the plant should be regenerated and should not be allowed to run beyond this.

However, for locomotive use it is reported that high residual hardness (to the extent of 4 p./100,000) than 1.5 p.p. 100,000 is tolerated in softened water. But, for better performance of the water softener it is not advisable to run it to higher limit of leakage. On the other hand, if desired for locomotive purposes, the softened water as obtained in the plant (i.e. with maximum hardness of 1.5 p.p. 100,000) may be suitably mixed with raw water to bring it to any stipulated degree of hardness.

APPENDIX G

Extract from letter No. 57R/56/10315 dated 27/28-6-1957 from the Assistant Director, Fuel Research Institute, Jcalgora, to the Joint Director Research, Railway Testing and Research Sub-centre, Chittaranjan.

Sub :—Testing of Carbion in the water softening plant at Bhalavni.

I give below the following information and particulars regarding the Carbion material, doses, consumption of salt and other important instructions that our representative promised to submit when he was there. These informations are in addition to the instructions given to him (your filter mechanic) by our representative at the site.

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2. The sample of brine solution (which is being used as regenerant at Bhalavni plant) handed over to our representative has been analysed for its salt content. The report on the analysis is presented below :—

Gm. of salt/100 cc. brine = 31.3
or, Lb. of salt/cu. ft. of brine = 19.5

3. The above analysis shows a much higher concentration of salt than should be used in regeneration. It has been established that for efficient regeneration of Carbion column, 10⁰/₀ brine (i.e. 10 gm. of common salt per 100 cc. of brine) solution should be used. This 10⁰/₀ brine would correspond to sp. gr. of 1.07 (approx.). The filter mechanic's report shows that sp. gr. of 1.20 is being maintained for the brine solution they are using. Actually, sp. gr. of 1.20 corresponds to a solution of 31.3 gm. salt/100 cc. brine. In fact this checks up the analysis report given in column 2. It is important to note that apart from the dosage of common salt (which should be 4 lb. per cu. ft. of Carbion), the total volume of brine solution used has significant effect on operative capacity. Hence the 10⁰/₀ concentration of salt in brine should be strictly maintained. This will be easily achieved by adjusting the sp. gr. at 1.07 instead of 1.20.
4. Other important and most essential data for water softening are the *total hardness of water*. The report of the filter mechanic gives the performance of the trials after the change-over to Carbion but no mention of the hardness of water being treated now has been made. At the moment with the *present* hardness it appears from the data supplied that per *softening cycle* (about 6 hrs) of the plant one may get 26,000—27,000 gallons of softened water (with maximum hardness of 1.5 p.p. 100,000). But it is important to note that the above capacity per cycle is dependent on the total hardness of water being treated. If the hardness of water goes up (as it may in rainy season) the above capacity will naturally come down. Hence, it is imperative that analysis (particularly the hardness) of water should be checked at least once in a week for efficient operation of the plant.

APPENDIX H

Copy of letter No. 5-W/WS/BLNI dated 22nd July, 1957, from the Chemist and Metallurgist, Central Railway, Parel, Bombay, to the Chief Engineer, Central Railway, Bombay, and copy to the Joint Director Research, Railway Testing and Research Centre, Chittaranjan.

Re : Testing of Carbion in the Water softening plant at Bhalavai.

Your attention is invited to Asstt. Director's (Fuel Research Institute, Jealgora) letter addressed to the Joint Director Research (M & C), Railway Testing and Research Centre, Chittaranjan, and copy of which has been endorsed to you.

In para 3 of that letter it is stated that brine of 1.2 sp. gr. (saturated) is being used at BLNI, for regeneration and that it should be reduced to 1.07 (10⁰/₀). It is pointed out that saturated brine is drawn into the softening barrel by the joint action of a hydraulic ejector and the partial vacuum created in the barrel as the water drains out of it from the bottom. In this process the saturated brine automatically gets diluted to about 10⁰/₀.

Incidentally, it may also be mentioned that with Carbion the quantity of common salt required for removing 1,000 grains of hardness works out to 0.52 lb. The corresponding figure for 'Basex' is 0.50 lb. single regeneration or 0.35 lb. double regeneration. At BLNI too when the Zeolite (Zeo-karb) was fresh the figure was only 0.35 lb. per 1,000 grains with single regeneration.

In view of this, a careful watch should be kept on the salt consumption at BLNI as Carbion gets old.

APPENDIX I

Copy of letter No. 1104/36176 dated 6th August, 1957, from the Chief Mechanical Engineer, South-Eastern Railway, Kharapur, to the Joint Director Research (M & C), Railway Testing and Research Sub-centre, Chittaranjan.

**Sub :—Water Treatment on Indian Railways,
Minutes of the 2nd meeting of the
Water Treatment Committee.**

Ref :—Your letter No. KRA/1/6 dated 17-7-57.

Boiler Inspectors on this Railway were instructed to study the washout method of the American Master Boiler Makers' Association. This method was discussed at length during recent Boiler Inspectors' Meeting. The principle of cooling-down system as adopted by the American Master Boiler Makers' Association is more or less similar to that in use on this railway. The main difference, however, is that in our practice washing of the boiler does not keep time with the draining of the hot water in the boiler. Attention of the Boiler Inspectors has been drawn to this and they have been instructed to examine the procedure in their respective sheds and to ensure that this principle is worked in order to avoid baking of scales on the boiler surfaces.

The results obtained after this procedure is brought into effect will be communicated in due course.

APPENDIX J

Copy of U. O. I. No. SL/SR dated 24-8-57 from the Director Standardization Mechanical Engg., R. D. S. O., Chittaranjan, to the Joint Director (M & C), R. T. C., Chittaranjan.

1. Chittaranjan-built WG locomotive No. 9422 was fitted with the blow-down counter device in accordance with CSO Sk. Nos. L-443 and 518 on the rear blow-off cock. The locomotive went into service towards the middle of March 1957 on the Eastern Rly.
2. Reports recorded by the Operating Staff indicate the need for improving the design in certain respects that are being studied in this office.
3. During a recent check, it was observed that the components of the device had rusted probably because of not having been used for some time.
4. It would be premature to assume that the design is satisfactory, and further trials with necessary modifications are essential. Greater interest on the part of the Operating Staff would also appear to be essential for the early finalisation of the design.
5. As has been mentioned on previous occasions, this office is attempting to develop a design which can be readily manufactured either by the Railway workshops or by any other general engineering works in the country. Some time must, therefore, necessarily elapse in order that the final design may be as fool-proof as possible.

APPENDIX K

Copy of letter No. 1104/37811 dated 17th August, 1957 from the Chief Mechanical Engineer, South-Eastern Railway, Khargpur, to the Joint Director Research, Rly. Testing and Research Sub-centre, Chittaranjan.

**Sub :—Progress reports.
Minutes of the 8th Meeting of the
Water-treatment Sub-committee.**

Ref :—Your No. KRA/1 dated 9th Aug., 1957.

The latest position in regard to the engines undergoing internal water-treatment on this Railway is as follows :—

<i>Loco Shed</i>	<i>No. of engines allotted</i>	<i>No. of engines under treatment</i>
Santragachi	16 WM & 28 others.	3 WM & 28 others.
Bhojudih	42	12 HX
Khargpur	104	14 WP 6 WG 1 WM

Details regarding the progress and effect of water-treatment in each of these sheds are given below :—

1. *Santragachi Loco shed* : The 3 WM engines continue to receive internal water-treatment. Reports regarding these 3 engines have been forwarded to you from time to time. During the last 2 months the engines have shown slight improvement in regard to leakage, etc. In regard to the scale condition of these engines, excepting for slight accumulation of sludge at the smoke box end, scale condition in general is satisfactory. During April 1957 some of the WM engines were transferred to other sheds and were replaced by GS class engines for suburban service. These GS class engines were also put on internal treatment but these have not so far given any trouble regarding leakage. The treatment on shunting engines at Santragachi continues to be satisfactory.
2. *Bhojudih Loco shed* : After the Board's orders were received on recommendation of the 2nd Meeting of the Water Treatment Committee, necessary staff for putting all the remaining engines of this shed on internal treatment has been recently sanctioned and it is expected that all the engines of this shed will be put on treatment from next month.
3. *Khargpur Loco shed* : Most of the engines which were put under internal water-treatment in March 1956 have been transferred from Khargpur to other sheds. The position was, therefore, reviewed recently and 14 WP, 6 WG and 1 WM engines have been re-nominated for treatment. The treatment is progressing satisfactorily.

Hydrostatic Dosing Gear : Trials were conducted with the C. S. O. design of hydrostatic dosing gear but considerable difficulties are being experienced due to the choking of clack valve. Trials are now being conducted after removing the clack valve and the central compartment dividing the main solution tank and the distribution tank.

Tannin for Internal Treatment : In view of the restrictions on imports due to difficult foreign exchange position, the procurement of Chestnut extract tannin is likely to be increasingly difficult. It is, therefore, felt that a decision regarding the use of indigenous tannins should be taken as early as possible in order to avoid discontinuity in the water-treatment.

APPENDIX L

Progress of the internal boiler feed-water treatment on the Western Railway for the period 1/2/1957 to 31/7/1957.

1. No. of Engines on Internal Treatment

The following table gives the up-to-date position of internal water-treatment on this Railway :

<i>Division</i>	<i>Shed</i>	<i>No. of engines treated</i>
Ajmer	Abu Road	70
	Nadiad	10
	Dabhoi	42
	Halol	4
	Godhra	29
Bhavnagar	Jetalsar	43
	Junagadh	25
	Hapa (Jamnagar)	51
Rajkot	Wankaner	48
	Morvi	5
	Surendranagar	41
	Mehsana	38
	Sabarmati	57
Total		463

2. General Observations

The period under review was the most crucial from the boiler standpoint in that it constituted the bulk of the summer months, during which feed-water sources usually deteriorate in the quality of water.

However, with a concerted drive to enforce manual dosing, it was possible to maintain boilers in a fairly clean condition on most of the bad-water sections of this Railway.

The new YL class locomotives which were fitted with automatic dosing gear have given evident proof of the efficacy of internal treatment in that their firebox plates and tubes remained clean or at the most, slightly scaled, right through their operation from November last year. In a few locomotives, however, the jamming of sludge in the lower region of the barrel necessitated removal of tubes to clear the waterways. A remarkable feature, however, has been the absence of pitting on the tubes which prior to internal treatment, was a regular feature on the Rajkot and Bhavnagar-Para divisions.

A detailed inspection of all standard IRS class boilers which have been under internal treatment since January 1956 reveals that on the whole, firebox plates and boiler tubes have remained clean or slightly scaled, though congestion of scale in the waterways, particularly in the lower region presents a problem. This possibly could only be solved if the belly blow-off cock is operated regularly on the run to eliminate the sludge. In this context, installation of a blowdown counter would decidedly be an advantage.

It is, however, generally observed that smaller boilers get more readily congested than larger ones though there has been a distinct improvement in the necessary time interval for descaling which formerly was every six months but after treatment it is from nine months to a year for small boilers, and over 12 months for large boilers. (Please see data sheet attached.)

At Ankleshwar and Godhra sheds, descaling which had to be undertaken on the shunting and other engines, has since the introduction of internal treatment become unnecessary as the tube area of these engines remains clean.

3. The Hydrostatic Dosing Gear

The 300 automatic hydrostatic dosing gears which were ordered from Trade are being supplied to the sheds on the Rajkot and Bhavnagar divisions and to date 90 have been installed on standard IRS locomotives. It is anticipated that in a couple of months, almost the entire fleet of locomotives on these two divisions will be fitted with automatic arrangement.

Service trials with the modified dosing arrangement gave indications that under certain combinations of levels in the tender and solution tanks, replenishing of the dosing tank became difficult due to an air lock and this necessitated shortening of the air enclosing pipe by 18". This, however, did not appreciably affect the treatment of the water in the tender because it hardly, if ever, happens that the level of water in the tender falls below 18" while the engine is on the run.

4. Staff

It was evident, that the mere equipping of locomotives with hydrostatic dosing gears would not be adequately effective unless simultaneously provision was made for the necessary staff for efficiently controlling the treatment and maintaining the dosing gears. Hence to derive the maximum benefit the following staff were sanctioned for eight major treatment sheds on the RJT and BVP divisions :

8 Chemists	Grade Rs. 80—220
33 Fitters	Rs. 60—130
33 Khalasis	Rs. 30—35

When these men are in position it is intended to instal a control laboratory in each shed where the chemist would investigate and determine not only the optimum dosage which is necessary to effectively keep engine boilers clean, but also report on the boiler condition of each locomotive in the shed. This organization will operate independently of the boiler staff in the shed to enforce effective and regular washout schedules.

5. Indigenous Tannin

Trials with indigenous copper vat cutch tannin which were initiated on this Railway since May 1957 still continue and from preliminary observations, it is noticed that the indigenous variety compares favourably with the foreign brand in its ability to keep the boiler clean. When used under identical conditions, it has been observed that it imparts a deeper tinge to the boiler concentrate than the foreign extract.

Due to the difficult foreign exchange position at present the Research Directorate has permitted the switch over to the indigenous variety although it is approximately costlier by Rs. 20/- per cwt.

6. Trials with Tanninated Coats on Boiler Tubes and Flues :

Engines Nos. YG 4035 and 81 P had their boiler tubes and flues recently coated with a tanninated film, while these engines were being POHed in Ajmer shops and the extent to which scale adherence would be inhibited will be reported in due course.

7. Extension of Internal Treatment

Since the last report, about 70 locomotives of ABR shed have been brought under treatment with dosing done at home shed and at Sabarmati, though no dosing is carried out at other watering stations, and on the trip towards the north, the quality of water at these points being suitable.

8. Treatment on the BG between Bombay Central, Viramgam and Godhra

With the increasing volume of traffic now moving on this section, the 14 softeners installed as early as 1948 are falling short in their maximum output and at many stations were forced to give a mixed feed to loco boilers.

It has, therefore, become necessary to decide whether internal treatment would be the answer to the problem of obtaining efficient boiler performance at the end of the Second Five Year Plan period taking into consideration the volume of traffic that would have to be moved at the end of that period. With this end in view, the WP locomotives of Parel (Bombay) shed recently turned out from POH have been fitted with hydrostatic dosing gears and are regularly being treated with the Solution Complex on their run between BCT and VG.

If their boilers remain clean at their IOH schedule, as compared with other locomotive boilers working on the same line, this would more or less help to decide the issue in favour of going in for internal treatment in preference to augmenting the capacity of the present softeners.

CONDITION OF LOCOMOTIVE BOILERS UNDER TANNIN : SODA ASH TREATMENT

S. No.	Eng. No. & Class.	Condition of tubes and flues.	Condition of firebox plates	Date of discaling of boiler in shed.	Mileage due by engine till 31-7-57	Whether dosing gear fitted	POH date or date put into service	No. of tubes removed to descale the barrel.
1	2	3	4	5	6	7	8	9
1.	7011 YL	Clean	Clean	3-6-57	18969	Yes	11-10-56	2 large and 15 small tubes removed.
2.	7046 "	"	"	7-8-57	16729	"	3-12-56	28 small tubes removed.
3.	7015 "	Slightly scaled	Slightly scaled	5-7-57	11534	"	20-12-56	24 small tubes removed.
4.	7036 "	"	"	21-8-57	10476	"	26-12-56	28 small tubes removed.
5.	7004 "	Clean	Clean	Not descaled	18045	"	11-10-56	Nil
6.	7005 "	"	"	"	20565	"	11-12-56	"
7.	7031 "	"	"	"	15818	"	20-12-56	"
8.	7032 "	"	"	"	14012	"	20-12-56	"
9.	7046 "	Slightly scaled	Slightly scaled	"	21681	"	24-10-56	"
10.	7048 "	"	"	"	18784	"	27-11-56	"
11.	7055 "	Clean	Clean	1-8-57	18950	"	20-11-56	49 small and 3 large tubes removed.
12.	7010 "	"	"	11-3-57	19809	"	26-11-56	23 small tubes removed.
13.	7025 "	Slightly scaled	Slightly scaled	Not descaled	15146	"	20-12-56	
14.	7034 "	"	"	"	14227	"	27-12-56	
15.	7043 "	"	"	"	12040	"	26-12-56	
16.	7045 "	"	"	"	12040	"	23-12-56	
17.	7037 "	"	"	"	16704	"	24-12-56	
18.	7053 "	"	"	"	8266	"	23-3-57	
19.	7052 "	"	"	"	8400	"	14-3-56	
20.	7006 "	Heavily Clean	"	"	25200	"	1-10-56	
21.	7028 "	Slightly Scaled	Clean	"	22600	"	15-10-56	
22.	1996 YP	"	"	"	28460	"	8-10-56	
23.	2102 "	"	"	"	13899	"	24-1-57	
24.	2179 "	Clean	"	Descaled in shops	73925	"	1-5-57 (IOH)	
25.	1964 "	Slightly scaled	Slightly scaled	Not descaled	24015	"	1-1-57	
26.	1985 "	"	"	11-8-57	38191	"	17-8-56	33 small and 4 large tubes.
27.	1986 "	"	"	Not descaled	51954	No	31-1-56	
28.	2151 "	"	"	"	50414	No	4-5-56	
29.	2162 "	"	"	"	52333	No	4-5-56	
30.	1998 "	"	"	"	27804	Yes	21-11-56	
31.	1981 "	"	"	"	64751	No	27-9-55	
32.	1988 "	"	"	"	154105	Yes	13-3-53	
33.	2090 "	"	"	14-12-56	20507	"	23-1-57	
34.	2097 "	"	"	Not descaled	18579	"	20-2-57	
35.	2171 "	"	"	"	89305	"	14-2-57	(IOH)
36.	2177 "	"	"	18-12-56	69063	No	18-4-55	50 small and 4 large tubes.
37.	2119 "	"	"	Not descaled	71135	Yes	29-3-55	26-4-57 IOH date.

1	2	3	4	5	6	7	8	9
38.	1971	YP	Slightly	Not descaled	26391	Yes	3-12-56	
39.	1974	"	Clean	18- 6-57	31456	"	30- 7-56	50 small and 4 large tubes.
40.	1975	"	"	4- 4-57	35278	No	25- 8-56	14 small tubes.
41.	1983	"	Slightly	Not descaled	30403	"	28- 9-56	
42.	1990	"	scaled	1- 6-57	39579	Yes	31- 5-56	29 small and 5 large tubes.
43.	1994	"	"	Not descaled	22270	"	16- 2-57	
44.	142	YD	"	"	43949	"	11- 9-55	
45.	147	"	"	"	28791	"	17- 3-56	
46.	150	"	"	"	35192	"	7- 3-56	
47.	153	"	"	"	36387	"	31- 1-56	
48.	154	"	"	"	28055	"	5- 6-56	
49.	157	"	"	"	14980	"	11-12-56	
50.	143	"	"	"	2-383	No	19-11-56	
51.	145	"	"	"	42769	Yes	30- 5-56	
52.	148	"	"	"	65349	No	19-12-56	
53.	152	"	"	Not descaled	329 9	"	9-10-53	
54.	156	"	"	21-11-56*	51579	"	30- 5-56	90 small and 3 large.
55.	158	"	"	6- 5-57		Yes	20- 4-55	
				Not descaled				

*descaled in shops.